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(71) Applicant(s)
Philip Head
178 Brent Crescent, Park Royal, LONDON, NW10 7XR, United Kingdom

(72) Inventor(s)
Philip Head

(74) Agent and/or Address for Service
Hillgate Patent Services
No 6 Aztec Row, Berners Road, Islington, LONDON, N1 0PW, United Kingdom

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GB 2142111 A GB 1030377 A US 5335723 A
US 5030291 A US 4612986 A US 4159742 A

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(54) Abstract Title
Apparatus for cleaning well casings or pipes

(57) Apparatus for cleaning a well casing or a pipe comprises a helical spring member 10 having sharp corners arranged outwardly to scrape accumulated deposits off the internal wall of a well casing or pipe. The spring member may be mounted on a length of tubing or be provided with a piston to enable it to be hydraulically or pneumatically driven along the inside of a tube. When mounted on a length of tubing, movement of the spring member 10 up and down the tubing is constrained by collars 12,13 catching upon a saddle 22. An hydraulic or pneumatic motor may be provided to induce rotational movement in the spring member.

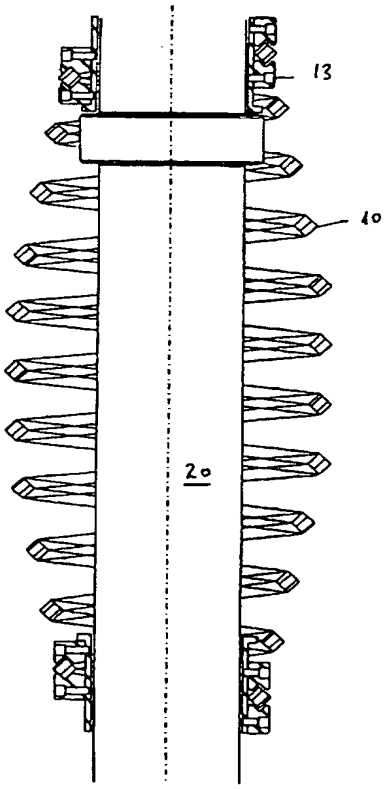

Fig. 1

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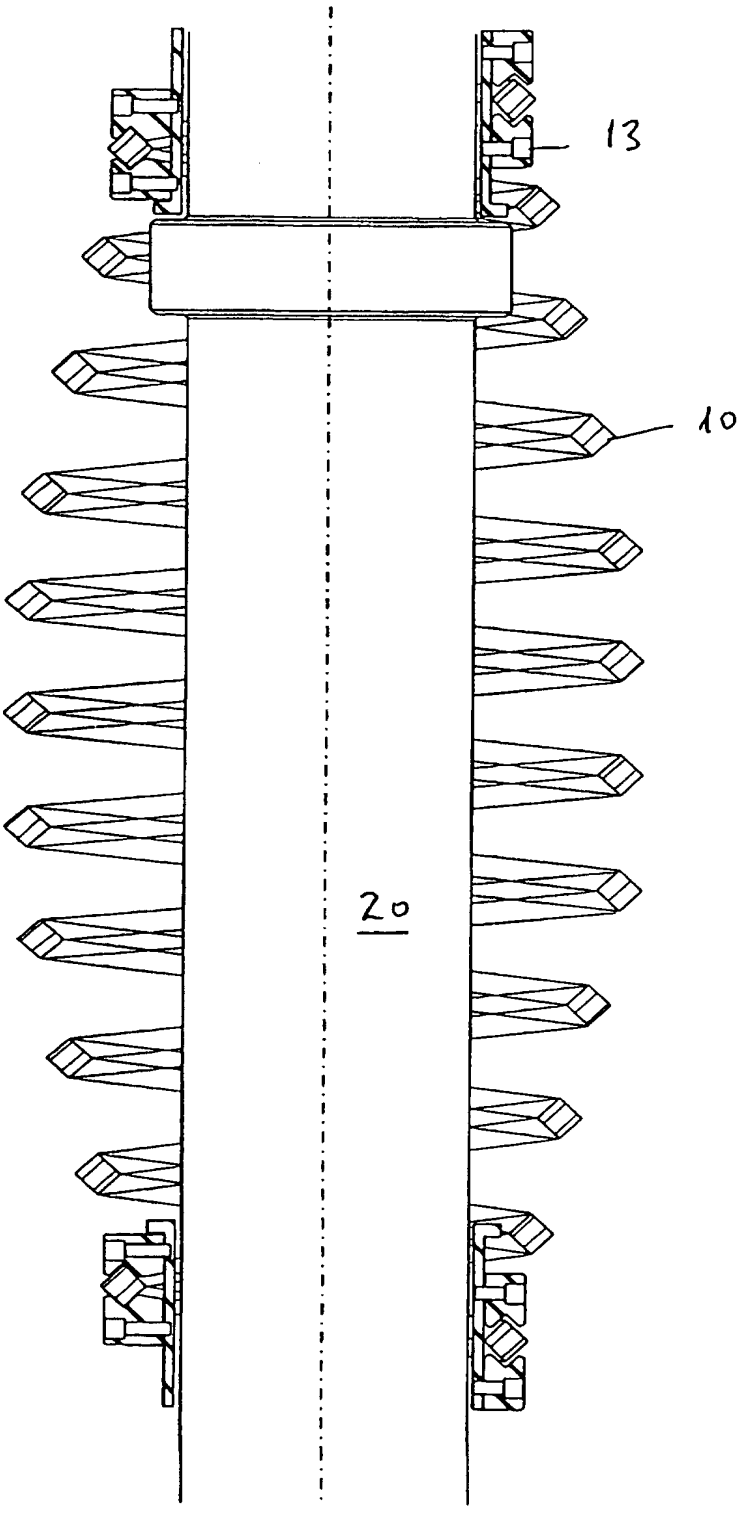

Fig. 1

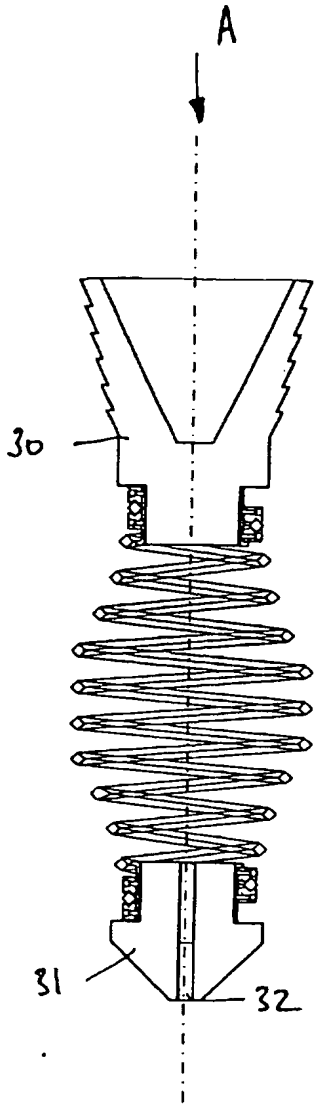

Fig. 2

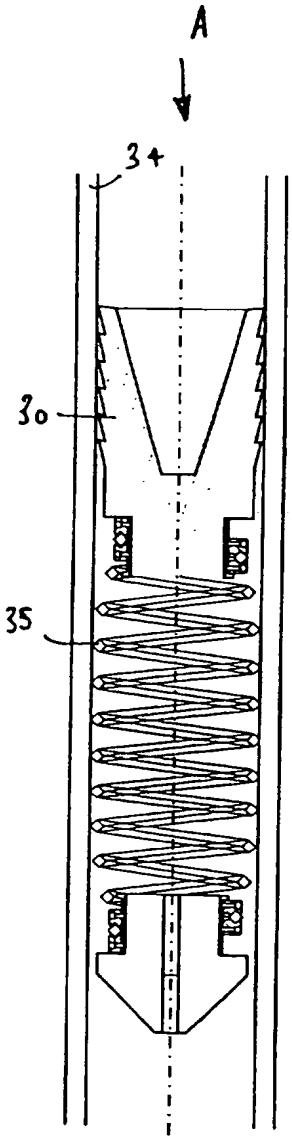

Fig. 3

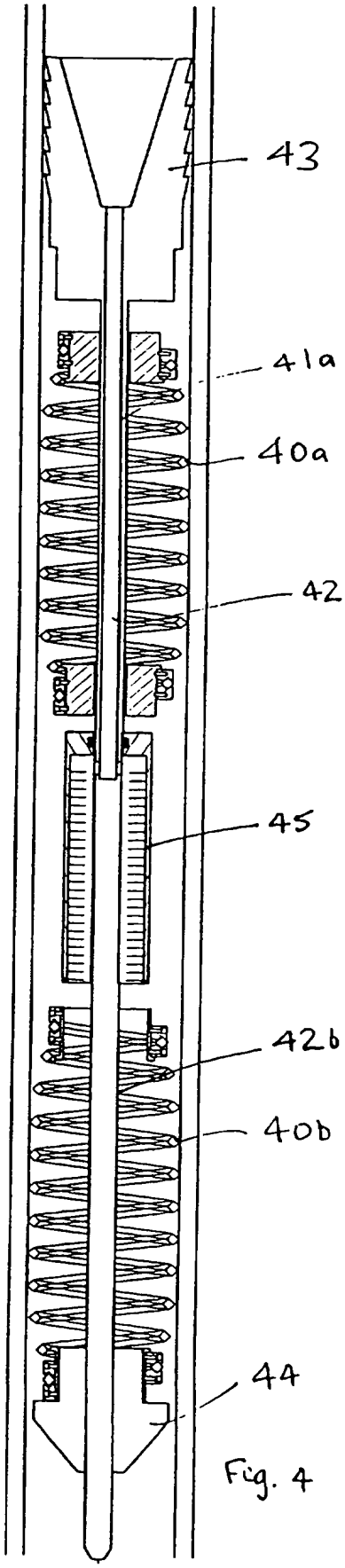

Fig. 4

Cleaning Apparatus

The present invention relates to a cleaning apparatus, in particular, a apparatus for scraping the inner bore of pipework, for example a well casing.

Oil is usually extract from a well by some type of conduit, such as a well casing. When oil has been produced for some time from the well, it is often found that matter from the oil has become encrusted upon the inner surface of the conduit. These deposits may be of very viscous oil, or of other mineral matter carried up with the oil, such as limescale, sand or corrosion of the base metal.

The result of these deposits is a reduction in the effect inner diameter of the well casing, and so a reduction in the flow of the oil from the reservoir.

A known device for attempting to alleviate these deposits comprises scraping blades which are moved through the well casing. Such blades are prone to break off or become caught in the deposit. Another known method uses a plurality of pads, which when moved through a well casing scour the inner surface. The bristles of such pads are usually inefficient at loosening tough deposits. Both these systems are relatively complex to make, involving many components and tend to clog up and become ineffective.

The object of the present invention is to provide an easily fabricated apparatus for removing or reducing deposits from inner surfaces of pipeworks.

According to the present invention there is provided cleaning apparatus for cleaning well casings and the like, comprising a resilient member comprising an external surface and being arranged in helical form such that the external surface of the resilient member acts against the internal wall, of a well casing, with a predetermined force.

The resilient member may arranged upon the end of a length of tubing.

Preferably the helical form is substantially cylindrical with a curved axial profile.

Preferably the resilient member forming the helix has an angular section providing a vertex which points radially and outwardly of the cleaning apparatus to engage the internal wall of a tube.

Hydraulic or pneumatic piston means may be associated with the cleaning apparatus which enable the apparatus to be propelled along a tube. Preferably hydraulic or pneumatic motor means are provided to induce a rotational movement in the spring member. Also a flow path may be provided through the apparatus to clear accumulated debris ahead of the device as it progresses.

Cleaning apparatus embodying the invention will now be described, by way of example, with reference to the following drawings in which:

Fig. 1 is a longitudinal cross section through one embodiment the cleaning apparatus according to the invention;

Fig. 2 is a longitudinal cross section of a further embodiment of the cleaning device of the invention;

Fig. 3 is a longitudinal section of the device of fig. 2 installed within a tube, and

Fig. 4 is a longitudinal cross section of a further embodiment of the cleaning device of the invention.

Referring to the drawings, a spring member 10 is mounted upon a length of tubing 20 by two collars 12,13. The tubing includes a saddle 22 located between the two collars.

The spring member 10 comprises a length of rod which has been wound into a helical shape. The diameter of the helix is not uniform, but is slightly larger than that of the tubing at its top and bottom, and widens to a maximum diameter midway along its length. The maximum diameter of the spring member is comparable to the inner diameter of the well casing. The rod has a uniform square section, and is aligned so that a diagonal line across this square joining two of the squares vertices is either perpendicular to or parallel with the axis of the helix. Thus the square vertices point outwardly to engage the inside walls of a tube which the device is to scrape clean.

The rod is composed of a resilient material such as steel. The helix may then be compressed or stretched both axially, and perpendicular to the axis so that its maximum diameter is altered.

A portion of the rod at each end of the spring member 10 is firmly secured in a collar 12,13, these collars encompassing the tubing 20 so as to be slidable upon it.

The spring member 10 is placed upon the tubing 20 so that the saddle 22 of the tubing is located between the two collars 12,13. The outer diameter of the saddle is greater than that of the inner diameter of the collars, so that the movement of the spring member up and down the tubing is constrained by the collars catching upon the saddle.

The spring member 10 is located close to one end of a length of tubing 20, but far enough away from the end to ensure that the collar closest to the end of the tubing cannot disengage from the tubing.

To operate the cleaning apparatus, the end of the tubing having the spring member upon it is inserted into the top of the well casing. The tubing is then forced downwards (say with a CT injector) through the well casing. When encrustations upon the inner surface of the well casing are encountered, the spring member will slide upon the tubing until the saddle constrains it. At this point it will continue with the tubing down the well casing, the diameter of the spring member catching upon and removing the deposits by a scraping action as it goes.

Some deposits may be of a very tough nature and have adhered themselves firmly to the well casing wall. If the scraper was of a very stiff material, there is a danger that the spring member could become caught upon the deposits and so stuck fast, or, in trying to free such a stuck spring member, a component of the scraper could be damaged. The material of the spring member though, being of a somewhat elastic nature, when encountering such a difficult deposit, the spring member deforms so as to expand axially and compress radially, reducing its diameter so that it can pass by these deposits.

When the tubing is hauled upwards, the spring member slides down the tubing until the upper collar engages with the saddle. Tough deposits not removed on the first run downwards may thus be acted upon on the return journey. Even when the spring member compresses somewhat to pass such deposits, some scraping action takes place. Particularly difficult deposits then may have several passes dedicated to gradually removing them.

The inner diameter of the well casing could either be monitored by separate equipment, or the resistance to movement of the tubing could be examined, giving an indication of the deposit levels at the point the location of the spring member.

The profile of the helix, and the section of the rod, may be varied to obtain different scraping characteristics. Although the spring member ideally engages with the tubing at both ends in order to remain aligned with the well casing, the saddle could be located at the end of the tubing, the end

of the spring member engaging with the end of the tubing as the tubing is lowered, and trailing behind the tubing as it is raised.

The system is here described for the scraping of the inner bore of a well casing, but it could equally be applied to any pipework which needs to have material excised from its inner bore.

Figs. 2 and 3 show an embodiment of the scrapping device 35 which in common with the previous embodiment is comprised of a spring 35 with outwardly facing points which scrape against the inside surface of the tube 34. The scrapping apparatus is provided with an hydraulic piston 30 seal at one end and a cone shaped nose 31 with a central hole 32 is provided at the opposite end. Thus hydraulic pressure provided behind the scrapping device in the direction of arrow A will cause the scrapping device to move in the direction of arrow A and as it does so clean the inside walls of the tubing 34.

This embodiment is preferably used for tubing which is open at both ends. Typically, although not necessarily, this would be tubing which is not in use at the time the cleaning is carried out but, instead, the tubing may be arranged on a reel and the scrapping apparatus can be inserted at one end and the hydraulic (or pneumatic) pressure applied behind it with an appropriate seal on the end of the tube. The scrapping device would pass through the entire length of the tube whilst the tube remained in its reeled state on a reel.

Referring now to fig. 4 a further embodiment is shown in which two spring members 40a, 40b are arranged in series along a central shaft in two parts

41a and 41b. The shafts 41a, 41b have a continuous hollow bore 42 extending from hydraulic plug means 43 arranged at one end on the device to a guide nose 44 arranged at the other end. An hydraulic motor 45 is arranged axially with respect to the shafts 41a, 41b and between the two spring members 40a, 40b. During us hydraulic fluid passes through the hollow bore 42 and drives the motor 45. The motor induces rotation movement in the spring members 40a, 40b. Preferably one spring 40a may be induced to rotate in the opposition direction to the other spring member 40b. As with previous embodiment the hydraulic fluid acting on the piston 43 also induces the cleaning device to move along the tube being cleaned so that the internal walls of the tube a progressively scrapped cleaned as the device passes along the tube. This rotation movement of the spring members in this embodiment assists with this cleaning action and also helps to remove the debris which has be scrapped off the internal wall of the tube and helps to prevent any clogging of the device by the debris.

The spring members are described here as either being lowered upon a length of tubing or driven hydraulically. Naturally, other means of lowering and driving the cleaning device could be used such as cable means of sufficient stiffness to propel the spring member through the well casing, and the driving force supplied to the spring member could be supplemented, for example, by traction means.

CLAIMS

1. Cleaning apparatus for cleaning well casings and the like, comprising a resilient member comprising an external surface and being arranged in helical form such that the external surface of the resilient member acts against the internal wall, of a well casing, with a predetermined force.

2. Cleaning apparatus for cleaning well casings and the like according to claim 1, wherein the resilient member is arranged upon the end of a length of tubing.

3. Cleaning apparatus for cleaning well casings and the like according to claim 1, wherein the helical form is substantially cylindrical with a curved axial profile.

4. Cleaning apparatus for cleaning well casings and the like according to claims 2 or 3, wherein the resilient member forming the helix has an angular section providing a vertex which points radially and outwardly of the cleaning apparatus to engage the internal wall of a tube.

5. Cleaning apparatus according to any preceding claim characterised in that hydraulic or pneumatic piston means are associated with the cleaning apparatus which enable the apparatus to be propelled along a tube

6. Cleaning apparatus according to claim 5, wherein hydraulic or pneumatic motor means are provided to induce a rotational movement in the spring member.

7. Cleaning apparatus according to claim 5, wherein a flow path is provided through the apparatus to clear accumulated debris ahead of the device as it progresses.

8. Cleaning apparatus substantially as herein described.

9. Any novel and inventive feature or combination of features specifically disclosed herein within the meaning of Article 4H of the International Convention (Paris Convention).

Application No: GB 9923374.4
Claims searched: 1-8

Examiner: David Pepper
Date of search: 9 December 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): E1F FLC; F2N.

Int Cl (Ed.6): B08B; E21B.

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2142111 A	(Baron et al)	1,5
X	GB 1030377 A	(Ward's Flexible Rod Co)	1,3
X	US 5335723 A	(Mouton)	1-3
X	US 5030291 A	(Titmas)	1,5
X	US 4612986 A	(Fosdick, Jr et al)	1,3,5
X	US 4159742 A	(Alexander, Jr)	1-3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.